



**2<sup>nd</sup> Annual NASA/JPL  
Small Business Symposium  
and Awards Ceremony**

***Small Businesses Building a  
High Tech Industrial Base for the Future***

***Ms. Ellen Stigberg***

***Strategic Integration and Management  
Exploration Systems Mission Directorate  
NASA Headquarters***

***November 2009***



## Mission statement

The Exploration Systems Mission Directorate (ESMD) is responsible for developing new capabilities and supporting technologies that enable sustained and affordable human exploration beyond low Earth orbit (LEO).

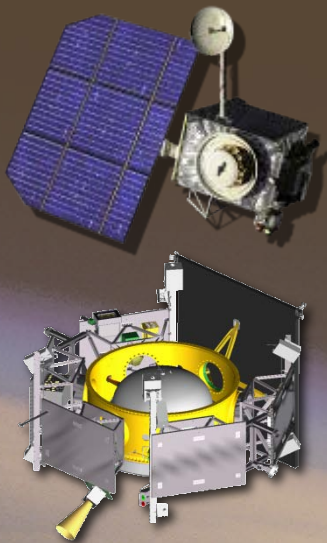
## Goals

- Explore the solar system and beyond
- Extend human presence across the solar system in preparation for human exploration of Mars and other destinations
- Develop the innovative technologies, knowledge, and infrastructures both to explore and to support decisions about future destinations for human exploration
- Promote international and commercial exploration participation to further U.S. scientific, security, and economic interests
- Develop robust commercial capabilities for LEO

# Exploration Systems Mission Directorate

## Advanced Capabilities

### Lunar Precursor Robotic Program



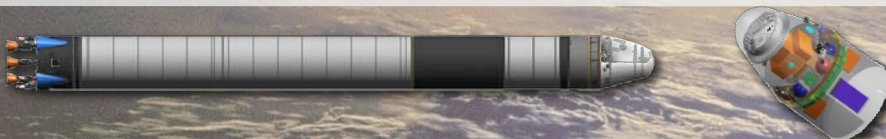
### Human Research Program



### Technology Development Program



## Commercial Crew and Cargo Program



## Constellation Program



***Solutions for Scientific and Human Exploration***

# Constellation Project Status

**NASA's near-term plan is to maintain March 2015 goal of initial operating capabilities for the first crewed Orion/Ares flight to the International Space Station**

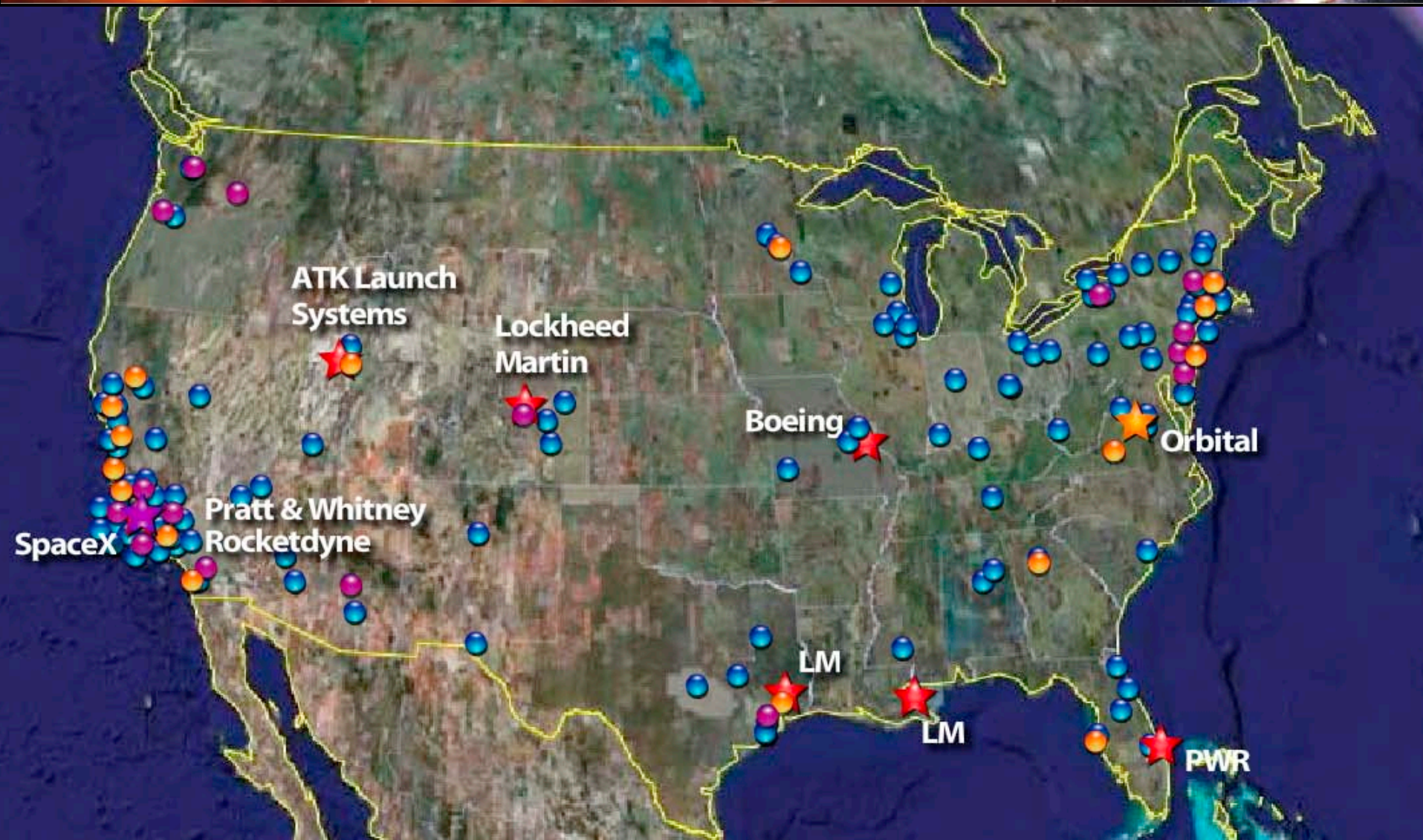
**Constellation has been executing the program for about 4 years and is well into the development phase**

## **Projects:**

- Ares
- Orion
- Ground Operations
- Mission Operations
- Lunar Efforts



# Constellation Workforce



# Exploration Technology Development Program

## Goals:

- Reduce human and robotic exploration mission risk by developing advanced technologies and capabilities.
- Mature critical near-term technologies to support development of the Orion Crew Exploration Vehicle and Ares I launch vehicle
- Develop long-lead technologies to support a sustainable lunar outpost.
- Conduct fundamental microgravity research and test technologies for exploration on the International Space Station.

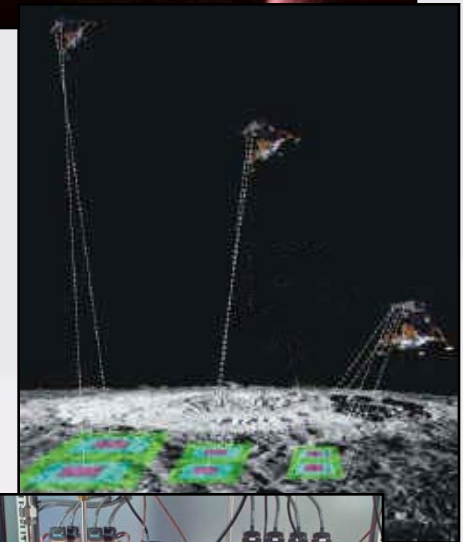
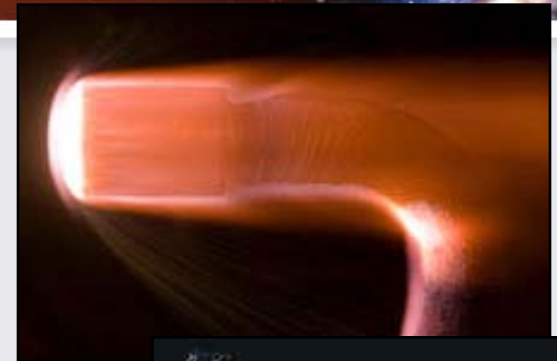
## Projects:

- ETDP consists of 22 focused technology development projects managed by the NASA Centers.
- Major projects include power and propulsion, structures and materials, life support, robotics, in-situ resource utilization, and microgravity research.



# Exploration Technology Development Program Research Areas

- Structures, Materials and Mechanisms
- Protection Systems
- Non-Toxic Propulsion
- Energy Storage and Power Systems
- Thermal Control for Surface Systems
- Avionics and Software
- Environmental Control and Life Support
- Crew Support and Accommodations
- ISS Research and Operations
- In-Situ Resource Utilization
- Robotics, Operations and Supportability
- Fission Surface Power Systems



## Goals

- Reduce spaceflight risks to humans and focus on the highest risks to crew health and performance during exploration missions
- Enable development of human spaceflight medical and human factors standards
- Develop and validate technologies that serve to reduce medical risks associated with human spaceflight

## Program Elements

- Program Science Management/NSBRI (PSM)
- ISS Medical Project (ISSMP)
- Space Radiation (SR)
- Human Health Countermeasures (HHC)
- Exploration Medical Capability (ExMC)
- Space Human Factors & Habitability (SHFH)
- Behavioral Health & Performance (BHP)



# HRP Program Content

## Space Radiation

- Human health effects, limiting factors for vehicle environments and crew selection; computational shielding modeling; measurement and warning technologies

## Exploration Medical Capability

- Medical care and crew health maintenance technologies (monitoring, diagnostic, treatment tools and techniques); medical data management; probabilistic risk assessment

## Human Health Countermeasures

- Integrated physiological, pharmacological and nutritional countermeasures suite; Extra-Vehicular Activity (EVA) related physiology research to support lunar EVAs

## Behavioral Health & Performance

- Behavioral health selection, assessment, and training capabilities; intervention and communication techniques to support exploration missions

## Space Human Factors & Habitability

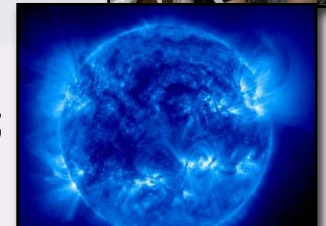
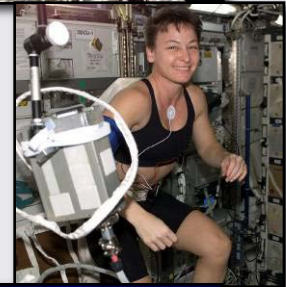
- Anthropometry, display/control, usability, cognition, habitability, lighting, ergonomics; advanced food development; lunar dust characterization and toxicological testing

## ISS Medical Project

- ISS research integration and operations, including Human Research Facility Racks 1 & 2

## Program Science Management/NSBRI

- Integration for HRP and National Space Biomedical Research Institute (NSBRI) funding



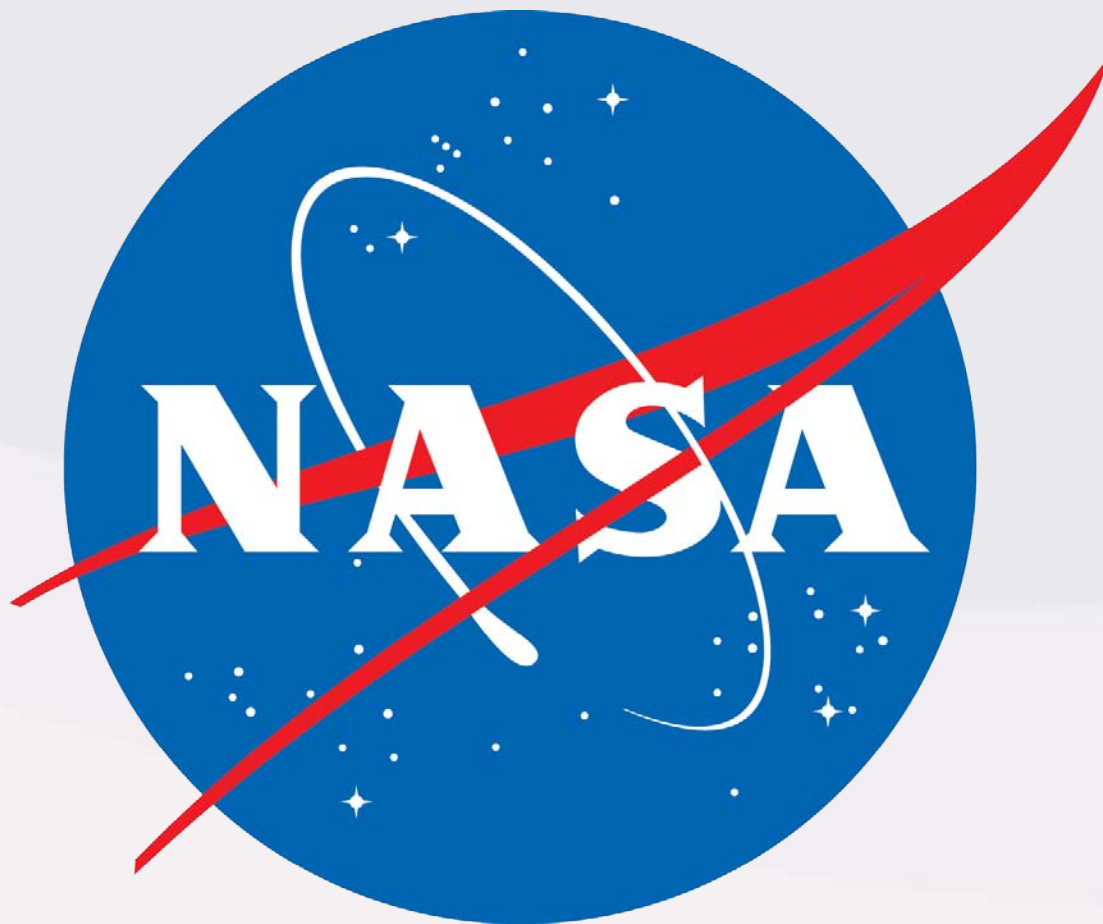
“As I have been telling our NASA senior leadership, this isn’t your father’s space program. Aggressive new ideas are emerging about non-government access to space and about human space flight and our challenge is to find new and creative ways to harness this spirit, facilitate their success without putting the American space program at undo risk, forging partnerships with these new entrepreneurs, and above all listening - listening and being open to these new approaches.

- NASA Administrator Charles F. Bolden Jr.



## **Exploration Systems Mission Directorate**

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